

REMARKS

Claims 1- 4, 6-17, 19 -30, 32, 34-72, 74, 76-85, and 88-91 are pending in this application. Claims 6, 7, 11, 12, 14-17, 22-24, 26, 34-40, 42-46, 49, 50, 53-58, 62-65, 68, 76-83, 85, and 89-91 have been withdrawn from consideration as being drawn to a non-elected invention. New claims 92 - 101 have been added. New claims 92, 93, 95-99 are readable on Group 1. New claim 94 is readable on Fig. 20d. New claims 100 and 101 are readable on Fig. 20b.

Claims 1, 3, 4, 8-10, 20, 25, 27, 28, 29, 47, 59, 61, 66, 67, 70, 71, 74 and 84, have been amended and claims 2, 5, 13, 18, 31, 33, 41, 73, 75, 86 and 87 have been cancelled without prejudice. Typographical errors have been corrected by replacing “then” with “than” in claims 20, 25, 61, 66 and 67.

Dependent claim 8 has been amended to depend from amended claim 1.

In amended Fig. 18 reference numeral 7 now points to the gap as described in the specification: “ gap 7 being formed between this waveguide and the lamp.”

While Applicants believe that the originally presented claims are patentable over all of the art cited in the Office Action as well as all other references submitted by Applicants, the claims have nonetheless been amended or cancelled as follows in order to expedite the application toward allowance. The amendments and cancellations are therefore made without prejudice or disclaimer, and Applicants reserve the right to pursue the original scope of the claims as provided prior to the cancellation or amendments, such as through continuation practice. Support for the amendments can be found throughout the specification, figures and in the claims as filed.

Specifically, support for the phrase as recited in claims 1 and 47, “wherein the uniformity of an optical output from the apparatus is enhanced and the radiation losses are lessened by said waveguide being positioned adjacent the lamp to reduce a gap formed between said second surface and the lamp and the distance between the first and second surfaces of said waveguide being of a selected length” can be found on page 26,

line 18 through page 27 line 10 and page 27 lines 20-30 and in original dependent claims 18, 19, 22 and 23.

Support for the phrase “wherein the source includes an axis having a length greater than a corresponding length of said second surface and said apparatus further comprises a second reflector having surfaces disposed adjacent said waveguide and spaced apart from the source, and having reflective surfaces substantially parallel to said second surface and extending beyond said second surface to direct photons from the source toward said first reflector” as recited in claim 59 can be found at page 12, lines 1-7 and Fig. 2a.

Support for the phrase “having an index of refraction greater than 1.4” in claim 66, can be found on page 27, line 3. Support for the phrase “having an index of refraction greater than 1.7” in claim 67 can be found on page 27, line 5. Support for the phrase as recited in claim 67 “walls are substantially uncoated” can be found on page 27, line 2.

Support for the phrases “ said waveguide and said reflective mechanism are each positioned substantially in point contact to said source” in claim 70 and “wherein said waveguide and said reflective mechanism are each positioned proximate to the source such that the losses of optical radiation due to reflections between the patient’s skin and said surface of said reflective mechanism are substantially minimized” as recited in claim 74 can be found on page 27 lines 8-10 and in original dependent claim 5.

Support for amended claim 84 and new dependent claim 95 can be found on page 28 line 9 through page 29 line 5 and Fig. 18.

Support for new dependent claim 92 reciting “plurality of angled walls extending between said first and second surfaces; and a second reflective mechanism at least partially surrounding said plurality of angled walls and having a plurality of reflective surfaces disposed substantially parallel to corresponding ones of said plurality of angled walls” can be found on page 11 lines 27-30 and Fig. 1a.

Support for new dependent claim 93 reciting “a third reflective mechanism disposed adjacent said waveguide and spaced apart from the lamp, and having reflective surfaces substantially parallel to said second surface and extending beyond said second surface to direct photons from the lamp toward said first reflective mechanism” can be found on page 12 lines 4-8 and Fig. 2a.

Support for new dependent claim 94 reciting “wherein said waveguide surface includes at least one of a modulated profile, a spatial mask, a flat mask and a phase mask” can be found on page 32 lines 15-21. Support for dependent claim 96 can be found on page 16 line 25 and Fig. 10. Support for dependent claim 97 can be found on in Fig. 19. Support for claim 98 and 99 can be found on page 24 line 4. Support for dependent claim 100 and 101 can be found Fig. 20b.

Accordingly, no new matter has been added by the proposed amendments.

Applicants respectfully traverse the Examiner’s rejections and request reconsideration of the application in view of the amendments made above and the remarks that follow.

Rejections under 35 U.S.C. § 102(b)

Claims 1-4, 9, 19-21, 25, 27, 32, 41, 47, 51, 59-61, 66, 67, 69, 70, 74 and 84 are rejected under 35 USC § 102(b) as being anticipated by Eckhouse (‘478). Based on the amendments and the following remarks, Applicants respectfully request reconsideration and withdrawal of the anticipatory rejections.

As amended, Applicants’ invention relates to an apparatus for performing a procedure on a treatment area of a patient’s skin. The apparatus includes a lamp, a waveguide adapted to be in optical communication with the patient’s skin and a mechanism for directing photons from the lamp through the waveguide to the patient’s skin to reduce photon leakage and other means to lessen radiation losses. Applicants’ specification describes various forms of waveguides (See, for example, page 3, lines 27-

32 of the Specification). In some embodiments of the invention, the waveguide can be a “concentrator waveguide” with walls which angle in so that the skin-contacting surface of the waveguide is smaller than the light-receiving side of the waveguide (see Specification page 11, lines 21-25). For example, the waveguide may be in the form of a cut right-angle pyramid (Fig.15) or a curved pyramid (Fig.16) prism. This “concentrator waveguide” provides increased intensity of the fluence from a lamp on the skin surface (see Specification, page 27, line 15).

In addition, Applicants have recognized that uniform output at the surface of a patient’s skin is desirable and can be achieved by selecting a waveguide length and in addition lessen energy loss in a waveguide due to absorption caused by reflections can also be achieved, for example, by selecting waveguide parameters such as length, shape and index of refraction and placement relative to the optical radiation source. (See, Specification 26, line 18 through page 27 line 10 and page 27 lines 20-30.

In contrast, the Eckhouse reference discloses a device, containing a flash lamp and an elliptical reflector to focus the source onto the treatment area. Eckhouse suggests that “Using the central 5 cm [of the tube] assures a high degree of uniformity of energy density in the exposed skin area.” The Eckhouse device disadvantageously blocks the focused output beam with an iris thereby increasing radiation losses. Eckhouse teaches that “[t]he reflector has an elliptical cross-section in a plane parallel to the axis of the linear flash tube, and the linear flash tube is located at one focus of the ellipse while the linear to circular transfer unit is located at the other focus of the ellipse.” The gap between the lamp 14 and the fiber bundle 96 of Eckhouse is not minimized but is positioned to be at the focal point of the elliptical reflector 98.

As recited in Applicants’ claim 1, the length of the waveguide is selected to enhance uniformity of an optical output and to lessen radiation losses. In several embodiments of the Applicants’ invention this waveguide configuration provides “optical conjugation between the reflector 3 and the skin 1 (i.e. the transportation of lamp light and reflected light to the skin and back with minimum losses).” (See, for example,

page 26, lines 19-20 of the Specification) Applicants have discovered in one embodiment that increasing the distance between the lamp and the waveguide by 1-3 mm will dramatically reduce the energy output at the first surface of the waveguide. For example, changing the gap between a 12 mm tube (i.e. a cooling tube surrounding a lamp) and input surface of a 12 mm x 50 mm waveguide from 1 mm to 3 mm reduces optical efficiency 15-20%.

The Eckhouse reference does not teach or suggest using a waveguide configured to enhance the uniformity of the optical output, and selecting the waveguide length and positioning the waveguide close to the optical source to lessen radiation losses, as required by independent claims 1, 47, 70 and 74 (and dependent claims dependent therefrom). Furthermore, the Eckhouse reference does not recognize the advantages of providing additional reflectors to lessen radiation losses as are disclosed by the Applicants' specification. The Eckhouse reference does not teach using a waveguide as recited by independent claims 1, 47 and 70, 74 configured to enhance the uniformity of the optical output.

Dependent claim 4 adds a further patentably distinct feature of the invention reciting "wherein said first reflective mechanism is sized and mounted with respect to the lamp so as to minimize the number of reflections for each photon reflected from said first reflective mechanism." Dependent claim 19 adds a further patentably distinct feature of the invention reciting " waveguide has resonances as a function of waveguide length, and wherein the length of said waveguide is equal to one of the resonant lengths ."

Dependent claim 27 adds a further patentably distinct feature of the invention reciting "said waveguide is patterned to control the delivery of photons to the patient's skin."

As claims 3-4, 9, 19-21, 25, 27, and 32, depend from allowable claim 1 and claim 51 depends from allowable claim 47 and cites additional structure, they too are allowable for analogous reasons.

As to claim 59 (and dependent claims dependent therefrom), the Eckhouse reference does not teach using a second reflector having surfaces disposed adjacent the waveguide and spaced apart from the source, and having reflective surfaces substantially parallel to the second surface of the waveguide to direct photons from the source toward said first reflector. Dependent claim 61 adds a further patentably distinct feature of the invention reciting " waveguide has resonances as a function of waveguide length, and wherein the length of said waveguide is equal to one of the resonant lengths ." As claims 60 and 61 depend from allowable claim 59 and cite additional structure, they too are allowable for analogous reasons.

The Eckhouse reference does not teach or suggest using a waveguide as recited by amended independent claim 66, having an index of refraction greater than 1.4 and adapted to be in optical contact with the patient's skin, said waveguide having a larger area at a radiation receiving surface than at a radiation output surface, and wherein said waveguide has curved sides between said radiation receiving and output surfaces.

The Eckhouse reference does not teach using an additional reflector to reduce photon loss as recited by amended independent claim 67: "having an index of refraction greater than 1.7 and ... having side walls between said surfaces wherein said walls are substantially uncoated . . . [and] a plurality of reflectors spaced apart from each of said walls to reflect photons from said source back through said walls."

The Eckhouse reference does not teach or suggest a "waveguide . . . having a surface in contact with the patient's skin which is patterned to control the delivery of photons to the patient's skin," as recited in claim 69.

Amended claim 70 is patentably distinct over Eckhouse, because the Eckhouse reference does not teach or suggest using a waveguide as recited by independent claim 70, "wherein said waveguide and said reflective mechanism are each positioned substantially in point contact to said source." As discussed above in conjunction with

claim 1, Eckhouse discloses a flash tube located at one focus of the ellipse such that the flash tube is spaced apart from both the reflector and the waveguide.

As discussed above in conjunction with claims 1 and 70, amended claim 74 and new claim 99 are not anticipated by Eckhouse.

Claim 84 has been amended to recite “waveguide includes an inner surface and an outer surface; and a reflective mechanism disposed on said outer surface.” Eckhouse does not disclose a unitary component with the lamp passing through an opening formed therein. Although Fig. 12 of Eckhouse shows “A doped optical fiber 105 is wound around lamp 102,” Eckhouse’s device does not include an inner surface and an outer surface; and a reflective mechanism disposed on said outer surface.

Applicants have cancelled claims 2 and 41.

Eckhouse does not teach or even suggest that the waveguide length can be selected to enhance the uniformity of the optical output and maximize (by lessening radiation losses) the ratio of heat production on a melanin target in the skin at a depth to the heat production at the basal layer. Because Eckhouse does not disclose or teach the recited features of the claimed invention, Applicants believe that Eckhouse does not anticipate, or render obvious, the claimed invention. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection over Eckhouse.

Rejections under 35 U.S.C. § 103(a)

A. Claims 28-30 and 70-72

Claims 28-30 and 70-72 are rejected under 35 USC § 103(a) as being unpatentable over Eckhouse (‘478) in combination with Currey.

As amended claim 28 recites “a unitary concave surface to uniformly treat an area of the patient’s skin proximate to said concave surface.” It is respectfully submitted that Currey does not teach a waveguide having a unitary surface due to the requirement of a

vacuum channel in the middle of the waveguide. Additionally claims 28-30 depend from allowable amended claim 1, and cite additional structure, they too are allowable for analogous reasons.

Claim 70 was amended to include a waveguide and a reflective mechanism each positioned substantially in point contact to said source. Neither Currey nor Eckhouse disclose the waveguide and reflective mechanism positioned as recited by claim 70. Accordingly, claim 70, as well as dependent claims 71 and 72 are patentably distinct over the references.

As discussed above in conjunction with claim 28, new claims 100-101, reciting “unitary concave surface,” are patentably distinct over Eckhouse in view of Currey.

Hence, both Eckhouse and Currey fail to meet all of the limitations of claims 28-30 and 70-72 and new claims 100-101. Because both Eckhouse and Currey do not disclose or teach all of the features of the claimed invention, Applicants believe that the references do not anticipate or render obvious the claimed invention and respectfully request that the Examiner reconsider and withdraw the rejections under Eckhouse and Currey.

B. Claims 1, 4, 10, 47, and 52

Claims 1, 4, 10, 47, and 52 are rejected under 35 USC § 103(a) as being unpatentable over Eckhouse (‘478) in combination with Anderson et al. (‘041). Applicants respectfully disagree with these rejections. Based on the following remarks and claim amendments, Applicants respectfully request reconsideration and withdrawal of the rejection of claims 1, 4, 10, 47, and 52.

As discussed above, the Eckhouse (‘478) reference does not teach or suggest using a waveguide, wherein the uniformity of an optical output from the apparatus is enhanced and the radiation losses are lessened by . . . being positioned adjacent the lamp to reduce a gap formed between said second surface and the lamp and the distance

between the first and second surfaces of said waveguide being of a selected length, as recited by claims 1 and 47.

The discrepancies of Eckhouse ('478) are not overcome by combination with Anderson et al. ('041). Anderson et al. ('041) discloses a laser illuminator including a differential optical radiator and a laser fiber with a diffusively reflective coating disposed within the differential optical radiator.

Since the optical radiation source of Anderson is a laser coupled into optical fibers and the optical radiation source of Eckhouse is a lamp reflected into a waveguide, and the Anderson radiator is "approximately equal to the length of the cavity to be irradiated" it difficult to see how the device of Eckhouse could be combined with the optical radiator of Anderson. Because the non-uniformities in Eckhouse and Anderson arise from different sources, in Anderson the radiator and coupling to a fiber laser, and in Eckhouse the optical output of the lamp, there would be no motivation to employ Anderson's diffuse reflector with the device of Eckhouse.

To provide uniformity, Anderson relies on:

"Generally, the optical characteristics of the radiator should be as follows. Diffusive reflectivity should be high in comparison to transmissivity, so that internal reflection and the concomitant uniformity of the transmitted light is maximized. Absorption should be minimized to prevent heat build up and to maximize efficiency. The desired optical properties can be imparted to the radiator by depositing, for example, paint or other pigment, quartz or alumina powder, or other metal powder, in or on the wall of the radiator. Generally, reflectivity in an area is increased by increasing the amount of deposited material," (Column 5 lines 47- 57) to provide uniform output.

The "diffusive reflectivity" of Anderson would not minimize radiation losses as is advantageously provided by Applicants device.

As the Examiner has pointed out in the Office Action mail July 13, 2004, the device of Anderson operates in a region where $H \gg B$. By relying on a waveguide which maximizes internal reflection and having a length $H \gg B$, the device of Anderson does not teach "being of a length selected to enhance uniformity of an optical output from the apparatus and to substantially lessen radiation losses," as recited in claim

1.(Emphasis Added) In contrast, Applicants use in some embodiments “short waveguides when their length $H \approx B$, the length of the waveguide should be close to the lengths for resonance H_1 , H_2 , H_3 , H_4 .” (Applicants’ Specification page 29 line 16-17)

It is not clear from the Office Action where Anderson’s diffuse reflector would be employed with the device of Eckhouse to produce Applicants’ device as claimed. One source of non-uniformity in Anderson’s device is the shape of the radiator, and this non-uniformity is minimized by controlling absorption reflectivity and transmissivity and utilizing reflections to obtain uniformity instead of configuring the parameters of the waveguide including length and index of refraction for uniform output and to minimize the number of reflections in some embodiments of the Applicants’ invention.

Furthermore, neither Eckhouse nor Anderson recognize the advantages of selecting waveguide length to lessen radiation losses as recited by independent claims 1 and 47, and, therefore dependent claims 4, 10 and 52. Since neither Eckhouse (‘478) nor Anderson (‘041) disclose or teach all of the limitations of the claimed invention, Applicants believe that the cited references do not anticipate or render obvious the claimed invention and respectfully request that the Examiner reconsider and withdraw the rejections of claims 1, 4, 10, 47, and 52.

C. Claims 1, 4, 13, 47, and 48

Claims 1, 4, 13, 47, and 48 are rejected under 35 U.S.C 103(a) as being unpatentable over Eckhouse (‘478) in combination with Hollnagel. Applicants have cancelled claim 13.

Hollnagel discloses an instrument containing a source of radiation and a quartz rod, which is coated with a metallic reflective material, for conveying the rays from the source. Hollnagel shows a lamp centered in a cavity (Figs. 2 and 3) and does not reduce the gap between the lamp and the waveguide. Hollnagel is silent on the placement of the long quartz rod relative to the lamp, does not disclose selecting the length of the rod for

any purpose and is unconcerned about enhancing the uniformity of the output of the dental illuminating unit which is not used for treating a patient's skin.

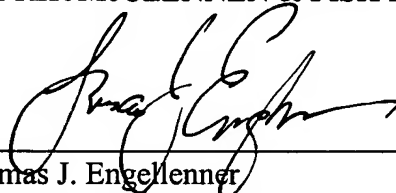
Applicants believe that neither Eckhouse nor Hollnagel, either alone or in combination teach or even suggest that the waveguide length can be selected to enhance the uniformity of the optical output and lessening radiation losses. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection over Eckhouse in combination with Hollnagel.

CONCLUSION

In summary, the above-identified patent application has been amended and reconsideration is respectfully requested for all the reasons set forth above. In the event that the amendments and remarks are not deemed to overcome the grounds for rejection, the Examiner is kindly requested to telephone the undersigned representative to discuss any remaining issues.

Respectfully submitted,

NUTTER McCLENNEN & FISH LLP



Date: August 29, 2005

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Red-line version
Proposed revision
of Fig 18
USPN 10/080,652

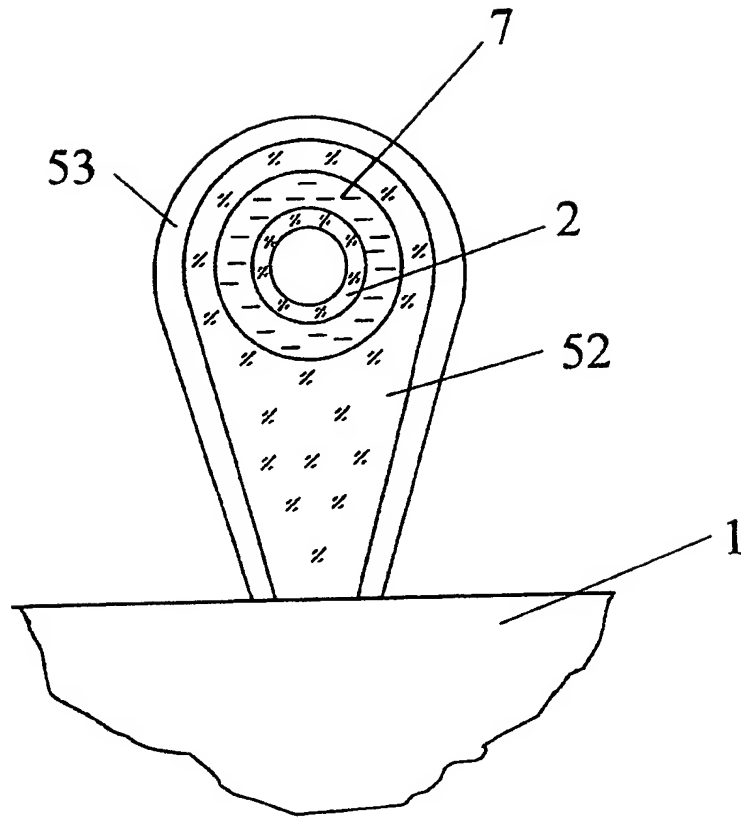


Fig. 18



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	First Named Inventor	SEE ATTACHED LIST		
	Title	SEE ATTACHED LIST		
	Art Unit	N/A		
	Examiner Name	Not Yet Assigned		
	Attorney Docket No.	SEE ATTACHED LIST		

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I am the:

☐ Applicant/Inventor.

☒ Assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96).

SIGNATURE of Applicant or Assignee of Record

Name	<input type="text" value="Patricia Davis"/>		
Signature	<input type="text" value="Patricia Davis"/>		
Date	<input type="text" value="12/02/03"/>	Telephone	<input type="text" value="781-993-2468"/>

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

☒ *Total of forms are submitted.

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STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: SEE ATTACHED LIST

Application No./Patent No.: SEE ATTACHED LIST Filed/Issue Date: _____

Entitled: _____

Palomar Medical Technologies, Inc., a CORPORATION
(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that it is:

1. ☒ the assignee of the entire right, title, and interest; or
2. ☐ an assignee of less than the entire right, title and interest.
The extent (by percentage) of its ownership interest is _____ %

in the patent application/patent identified in the attached list by virtue of either:

A. ☒ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

OR

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as shown below:

1. From: _____ To: _____
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☐ Additional documents in the chain of title are listed on a supplemental sheet.

☐ Copies of assignments or other documents in the chain of title are attached.

(NOTE: A separate copy (i.e., the original assignment document or a true copy of the original document) must be submitted to Assignment Division in accordance with 37 CFR Part 3, if the assignment is to be recorded in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

12/02/03
Date

781-993-2468
Telephone Number

Patricia Davis
Typed or printed name

[Signature]
Signature

Authorized Signer for Assignee
Title

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ASSIGNMENT

For good and valuable consideration, the sufficiency of which is hereby acknowledged, we, the undersigned, Gregory B. Altshuler, 137 Marion Street, Wilmington, MA 01887 and Michael Z. Smirnov, 40/2 Korablestroiteley #35, St. Petersburg, Russia, hereby:

Sell, assign and transfer to Palomar Medical Technologies, Inc., a Massachusetts corporation having a place of business at 82 Cambridge Street, Burlington, MA 01803, its successors, assigns and legal representatives, all hereinafter referred to as the Assignee, the entire right, title and interest for the United States and all foreign countries, in and to any and all inventions which are disclosed in the application for United States Letters Patent filed in the United States Patent and Trademark Office, bearing attorney docket number P00547.70088.US, on December 27, 2002 under Serial No. 10/331,134 and entitled **METHOD AND APPARATUS FOR IMPROVED VASCULAR RELATED TREATMENT**, and in and to said application and all divisional, continuing, substitute, renewal, reissue and all other applications for Letters Patent which have been or shall be filed in the United States and all foreign countries on any of said inventions; and in and to all original and reissued patents which have been or shall be issued in the United States and all foreign countries on said inventions including the right to apply for patent rights in each foreign country and all rights to priority;

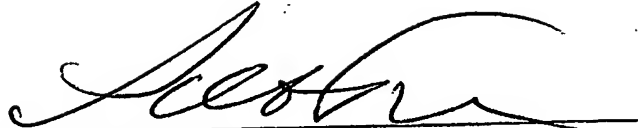
Agree that said Assignee may apply for and receive Letters Patent for said inventions in its own name; and when requested, without charge to but at the expense of said Assignee, we agree to carry out in good faith the intent and purpose of this assignment, by executing all divisional, continuing, substitute, renewal, reissue, and all other patent applications on any and all said inventions, by executing all rightful oaths, assignments, powers of attorney and other papers, by communicating to said Assignee all facts known to us relating to said inventions and the history thereof, and generally by doing everything reasonably possible which said Assignee shall consider desirable for aiding in securing and maintaining proper patent protection for said inventions and for vesting title to said inventions and all applications for patents and all patents on said inventions, in said Assignee;

Request the Honorable Commissioner of Patents and Trademarks to issue said Letters Patent to said Assignee; and

Covenant with said Assignee that no assignment, grant, mortgage, license or other agreement affecting the rights and property herein conveyed has been made to others by us and that full right to convey the same as herein expressed is possessed by us/me.

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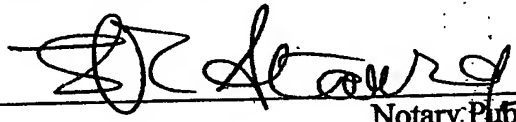
JUNE 10, 2003
Date


Gregory B. Altshuler

STATE OF MASSACHUSETTS :
COUNTY OF MIDDLESEX :

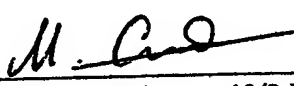
Subscribed and sworn to before me this 10th day of JUNE 2003.

SEAL


Notary Public

My Commission Expires DECEMBER 16, 2006
LA-RAE STRAWBRIDGE, NOTARY PUBLIC
MY COMMISSION EXPIRES

June 10, 2003
Date


Michael Z. Smirnov, 40/2 Korablestroiteley #35
St. Petersburg, Russia

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LIST OF PATENT APPLICATIONS SUBJECT TO NEW POWER OF ATTORNEY AND CORRESPONDENCE ADDRESS

Docket No.	App Date	App No	Record Dt	Reel/Frame	Assignee
105090-0074RCE	18JA2002	10/052,474	11AU2000	0111120/060	PALOMAR MEDICAL TECHNOLOGIES, INC.
105090-0076	22FE2002	10/080,652	04JE2002	012950/179	PALOMAR MEDICAL TECHNOLOGIES, INC.
105090-0078	23MY2002	10/154,756	15OC2002	013390/662	PALOMAR MEDICAL TECHNOLOGIES, INC.
105090-0080	02JL2002	10/188,319	19SE2002	013300/055	PALOMAR MEDICAL TECHNOLOGIES, INC.
105090-0083	17SE2002	10/245,825	17MY1999	009975/435*	PALOMAR MEDICAL TECHNOLOGIES, INC.
105090-0088	27DE2002	10/331,134 awaiting PTO confirmation of recordal**			PALOMAR MEDICAL TECHNOLOGIES, INC.
105090-0101	17AP2003	10/417,769	11AU2000	0111120/060	PALOMAR MEDICAL TECHNOLOGIES, INC.

* recorded in parent application 09/268,433

** copy of assignment already submitted for recordal attached

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